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**Declaration under Rule 4.17:**

— of inventorship (Rule 4.17(iv)) for US only

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For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.

(54) Title: GLUTEN BIOPOLYMERS

(57) Abstract: This invention consists of a modified gluten biopolymer for use in industrial applications, such as composites and foams. In the present work, the fracture toughness of the gluten polymer was improved with the addition of a thiol-containing modifying agent. This work also resulted in the development of a gluten biopolymer-modified fiber bundle, demonstrating the potential to process fully biodegradable composite materials. Qualitative analysis suggests that a reasonably strong interface between the natural fibers and biopolymer matrix can form spontaneously under the proper conditions. Therefore this invention relates to a modified gluten biopolymer for use in industrial applications, such as composites, stabilized foams and molded articles of manufactures. The present invention relates to a new gluten based biopolymer with modified properties, such as an increase in impact strength, and prepared by using thiol-containing molecules. The multifunctional activity of the polythiol-containing molecules generates the potential for the development of a new material base for commodity plastics. The invention furthermore relates to a new composite material comprising gluten-coated fiber, its use and the method for preparing the composite material.

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# INTERNATIONAL SEARCH REPORT

International Application No

PCT/BE 03/00163

## A. CLASSIFICATION OF SUBJECT MATTER

IPC 7 C08H1/00 C08L89/00 C08K9/08 C08J5/04 B27N3/00  
B27N3/04

According to International Patent Classification (IPC) or to both national classification and IPC

## B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC 7 C08H C08L C08K C08J B27N

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

EPO-Internal, WPI Data, PAJ, CHEM ABS Data

## C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US 5 665 152 A (BASSI SUKH ET AL) 9 September 1997 (1997-09-09) cited in the application claims 1-45	1-18,22
A	US 6 045 868 A (HERNANDEZ RUBEN J ET AL) 4 April 2000 (2000-04-04) column 5, line 6 - line 33; claims 1-17	1-18,22
X	WO 02 059212 A (REDL ANDREAS ;AMYLUM EUROP N V (BE); GUILBERT STEPHANE (FR); ENSAM) 1 August 2002 (2002-08-01) claims 1-19; examples 1-6	19-21, 23,24

☐ Further documents are listed in the continuation of box C.

☒ Patent family members are listed in annex.

### \* Special categories of cited documents :

- \*A\* document defining the general state of the art which is not considered to be of particular relevance
- \*E\* earlier document but published on or after the international filing date
- \*L\* document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)
- \*O\* document referring to an oral disclosure, use, exhibition or other means
- \*P\* document published prior to the international filing date but later than the priority date claimed

- \*T\* later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
- \*X\* document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
- \*Y\* document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.
- \*Z\* document member of the same patent family

Date of the actual completion of the international search

23 March 2004

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# INTERNATIONAL SEARCH REPORT

International application No.  
PCT/BE 03/00163

## Box I Observations where certain claims were found unsearchable (Continuation of item 1 of first sheet)

This International Search Report has not been established in respect of certain claims under Article 17(2)(a) for the following reasons:

1. ☐ Claims Nos.:  
because they relate to subject matter not required to be searched by this Authority, namely:
2. ☐ Claims Nos.:  
because they relate to parts of the International Application that do not comply with the prescribed requirements to such an extent that no meaningful International Search can be carried out, specifically:
3. ☐ Claims Nos.:  
because they are dependent claims and are not drafted in accordance with the second and third sentences of Rule 6.4(a).

## Box II Observations where unity of invention is lacking (Continuation of item 2 of first sheet)

This International Searching Authority found multiple inventions in this International application, as follows:

see additional sheet

1. ☐ As all required additional search fees were timely paid by the applicant, this International Search Report covers all searchable claims.
2. ☐ As all searchable claims could be searched without effort justifying an additional fee, this Authority did not invite payment of any additional fee.
3. ☒ As only some of the required additional search fees were timely paid by the applicant, this International Search Report covers only those claims for which fees were paid, specifically claims Nos.:  
1-24
4. ☐ No required additional search fees were timely paid by the applicant. Consequently, this International Search Report is restricted to the invention first mentioned in the claims; it is covered by claims Nos.:

Remark on Protest

- ☐ The additional search fees were accompanied by the applicant's protest.
- ☒ No protest accompanied the payment of additional search fees.

**FURTHER INFORMATION CONTINUED FROM PCT/ISA/ 210**

This International Searching Authority found multiple (groups of) inventions in this international application, as follows:

1. Claims: 1-18,22

Modified gluten polymer which is covalently crosslinked by means of a thiol-containing modifying agent, process for its preparation, composite materials made therefrom and its use

2. Claims: 19-21, 23-24

Composite material containing (unmodified) gluten and fibres, process for its preparation and use

3. Claim : 25

Compression moulded (unmodified) gluten

# INTERNATIONAL SEARCH REPORT

information on patent family members

International Application No

PCT/BE 03/00163

Patent document cited in search report		Publication date	Patent family member(s)	Publication date
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